Sudoku Solver (Optimization)

Quoting Wikipedia : "Sudoku is a logic-based, combinatorial number-placement puzzle. The objective is to fill a 9×9 grid so that each column, each row, and each of the nine 3×3 boxes (also called blocks or regions) contains the digits from 1 to 9 only one time each. The puzzle setter provides a partially completed grid." The rules for an N^2 X N^2 sudoku are as follows:

1. The board is consists of N^2 rows and N^2 columns.
2. Numbers between 1 and N^2 (inclusive) are to be filled in each row such that:
   1. All numbers in each row are distinct.
   2. All numbers in each column are distinct.
   3. All numbers in the sub-matrix having rows from $(i*N + 1)$ to $(i + 1)*N$, and columns from $(j*N + 1)$ to $(j + 1)*N$ both inclusive, should be distinct. $0 <= i,j <= N-1$. Rows and columns are 1 indexed. Each such sub-matrix is called a "box" or "region".

5	3			7				
6			1	9	5			
	9	8					6	
8				6				3
4			8		3			1
7				2				6
	6					2	8	
			4	1	9			5
				8			7	9

5	3	4	6	7	8	9	1	2
6	7	2	1	9	5	3	4	8
1	9	8	3	4	2	5	6	7
8	5	9	7	6	1	4	2	3
4	2	6	8	5	3	7	9	1
7	1	3	9	2	4	8	5	6
9	6	1	5	3	7	2	8	4
2	8	7	4	1	9	6	3	5
3	4	5	2	8	6	1	7	9

For this problem, you are required to solve a general N^2 X N^2 sudoku puzzle. Given a partially filled sudoku board, you have to fill it in as "perfect" a manner as possible.

Input:

The first line contains N,K. The following K lines contain 3 numbers: x, y and d. $1 <= x,y,d <= N^2$. This means that a number d is present on the board at position (x,y) $2 <= N <= 30$ $0 <= K <= N^4$ At most 50% of the board will be covered at the start. All positions (x,y) in the input will be unique.

Output:

The output consists of N^2 rows having N^2 numbers each. Each number should be between 1 and N^2 (inclusive) and separated by a space. If the initial grid has a number d at position (x,y), then even the output should have the number d at position (x,y).

Scoring:

A solution is "accepted" if:
- It solves a series of sudoku puzzles that have only one possible solution (no mandatory penalty)
- For a sudoku that must incur an obvious small penalty this penalty is as low as possible. The format for penalty calculation is as follows:
  - For each row and every number K in the range 1 to N^2 that is missing from the row, incurs a penalty of 1.
  - For each column and every number K in the range 1 to N^2 that is missing from the column, incurs a penalty of 1.
  - Similarly, for each box and every number K in the range 1 to N^2 that is missing from the box, incurs a penalty of 1.

A box (as explained above) is a N X N square and the grid can be divided into N^2 such non-overlapping boxes.

Example 1 (No penalty):

Input:

```
2 4
1 3 1
2 1 4
3 4 2
4 2 3
```


Output:

```
3 2 1 4
4 1 2 3
1 4 3 2
2 3 4 1
```

Penalty:

No penalty

Example 2 (Minimum penalty):

Input:

```
2 12
1 1 1
1 2 2
1 3 2
1 4 4
2 1 4
2 2 3
2 3 3
2 4 2
4 1 3
4 2 1
4 3 2
4 4 4
```


Output:

```
1 2 2 4
4 3 3 2
2 4 1 3
3 1 2 4
```

Penalty:

(1 + 1 + 0 + 0) + (0 + 0 + 1 + 1) + (0 + 1 + 0 + 0) = 5   (This penalty is mandatory)